10 March 2002

Inner Heliospheric Gas and Dust from Solar Wind Charge Exchange

Michael R. Collier mcollier@pop600.gsfc.nasa.gov
Thomas E. Moore Thomas.E.Moore@gsfc.nasa.gov
Keith W. Ogilvie keith.ogilvie@gsfc.nasa.gov
David Simpson david.simpson@gsfc.nasa.gov
Mei-Ching Fok mei-ching.fok@gsfc.nasa.gov
Dennis Chornay Dennis.Chornay@gsfc.nasa.gov
John Keller jwk@mecdes.gsfc.nasa.gov
NASA/GSFC, Greenbelt, MD 20771

Stephen Fuselier fuselier@mail.spasci.com
Space Physics Lab, LMATC, 3251 Hanover St., Palo Alto, CA 94304-1191

Jack Quinn quinn@unhedi2.sr.unh.edu
University of New Hampshire, Durham, New Hampshire 03824

Peter Wurz peter.wurz@soho.unibe.ch
University of Bern, CH-301, Switzerland

M. Wuest mwuest@swri.edu
Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas

K.C. Hsieh hsieh@cc.it.arizona.edu
University of Arizona, Department of Physics, Tucson 85721

B.T. Tsurutani btsurutani@jplsp3.jpl.nasa.gov
Jet Propulsion Laboratory, California Institute of Technology, Pasadena

The Low Energy Neutral Atom (LENA) imager, launched on the IMAGE spacecraft in March of 2000, detects neutral atoms with energies from 10 eV up to >1 keV. Because LENA has low sensitivity to light and looks directly at the Sun every spin during six months of the year, it has observed a neutral component of the solar wind that results when solar wind ions charge exchange with interstellar neutrals, dust and the Earth's geocorona [Collier et al., JGR, 106, 24,893, 2001]. We examine long term variations in the intensity of the counting rate from the solar direction. Results from year 2001, during which the instrument state remained constant, show a maximum in the count rate between June and July with a long, low count-rate period stretching from mid-November through

early March. This annual modulation of solar wind energetic neutral atom flux at the Earth is interpreted as a pronounced variation of the neutral gas column density between the Sun and the Earth with season. This modulation is evidently dominated by interstellar neutral gas and the solar erosion of that gas in the galactic downstream region. It also contains a relatively constant contribution from inner solar system dust and relatively smaller variations produced by solar wind fluctuations and possibly structure in the dust population. The LENA observations place an upper limit on the column density of dust at 1 AU of $\Gamma^{1\ AU}<6x10^{-19}$ cm^{-1}. Implications of the LENA data on the interpretation of observations of low frequency electromagnetic waves by Tsurutani et al. [1994] will also be considered.